

LESSON 10 – Energy vs. Angles

High aspect stuff is pretty complicated, so we'll use this lesson to make sure your decision to go one circle or two circle is based on sound tactical (i.e., sound physical) reasons.

Reading:

Shaw **pp. 98-138**

Problems/Questions:

Work on Problem Set 2

Objectives:

- 10-1 Understand what an angle fighter's primary tactics are and the physics principles used for this method of aerial combat.
- 10-2 Understand what an energy fighter's primary tactics are and the physics principles used for this method of aerial combat.

Last Time:	High-Aspect BFM Lead Turns, turning room, defenses One-circle vs. two-circle fights
Today:	Review of computer exercise Energy vs. Angles Vertical Turning Maneuvers Flat Scissors Rolling Scissors Defensive Spiral

Go over graphs, assumptions ($n = G_r$ in level turn, gives an advantage; Only 1G increments allowed; P_s only calculated for 10000 ft (probably will average out, but who knows for sure, etc.)), If your vertical turn didn't win, why not?

The turn may not have won for several reasons, but primarily it's because it's an energy fighter's tactic. Energy fighters must be patient, and we only looked at one half turn for the comparison between level and vertical turns.

Angles fight: Initially try to out-rate the bandit to get the first shot. Gives up energy right off the bat. Good for high-rate fighters, but a miss could leave you a sitting duck. (Talk about Cobra, Somersault by Su-37, X-31 high angle of attack tactics)

Show movies of SU-37 maneuvering

Energy fight: Initially, try to increase energy level with respect to the bandit and then convert for a shot. Good for experienced, talented pilots, but takes a lot of time (relatively) for a shot, leaving you exposed to a spear-chucking wingman.

Show graphs for an energy fighter vs. an angles fighter from the computer model after a couple of turns.

Vertical Turning: The important factor about who can turn better is the attacker's radius projected onto the defender's turning plane.

Show on the board and with the overhead from Shaw.

Counters to a vertical turning bandit are to put your lift vector on the attacker and pull. This puts your turning plane on his, meaning that the projection of his radius onto your plane is always the max it can be. As he goes up, so do you, so similar advantages/disadvantages happen to your rate/radius.

Maneuvers:

Flat Scissors: multiple lead turns, energy management. The winner of a flat scissors is usually the one who can go slower faster but maintain total energy best.

Show overhead from Shaw, .avi from F-15 RTU.

Rolling scissors: Similar concept using oblique planes for the lead turns. Hard to use unless you're used to thinking about turn performance in vertical turns (the continuously changing rate/radius/G available, etc)

Show overhead from Shaw.

Defensive Spiral: Almost like a rolling scissors going downhill. This keeps you at corner velocity longer, but has a definite limit on how low you can

go. It forces the attacker to pull much harder to get a shot and it constantly changes the defender's plane of maneuver, so a tracking gunshot is very tricky. (Remember the three requirements for a tracking gunshot: in plane, in range, nose in lead. To defeat the track, all you have to do is defeat one of these things...the defensive spiral makes staying in plane very difficult.)

Show overhead from Shaw